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REVIEW OF THE U. S. ARMY AEROMEDICAL  
RESEARCH LABORATORY CONFERENCE ON  
AEROMEDICAL EVACUATION HELD ON 15-16  
JANUARY 1974

Frank S. Pettyjohn, et al

Army Aeromedical Research Laboratory  
Fort Rucker, Alabama

August 1974

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**20. ABSTRACT (continued)**

Assistance to Safety and Traffic, as well as in its combat evacuation role requires combined emphasis and upgrading of medical equipment and procedures.

This conference represents a unique approach to the problems of maintaining pace with the rapid developing field of aeromedical evacuation. The informal seminar structure provided the helicopter unit, the user, an opportunity to discuss problem areas of medical and operational needs with the U.S. Army Aeromedical Research Laboratory, the developer. In addition, this conference represented a first in bringing together operational helicopter unit personnel from both the U.S. Army and the U.S. Air Force to discuss common problems.

The concepts, ideas and suggestions presented should insure the continued improvement of medical equipment and techniques to provide the highest degree of medical care to the U.S. Military Forces.

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**USAARL REPORT NO. 75-4**

**REVIEW OF THE U.S. ARMY AEROMEDICAL RESEARCH LABORATORY  
CONFERENCE ON AEROMEDICAL EVACUATION  
15-16 JANUARY 1974**

**By**

**LTC Frank S. Pettyjohn, M.D.**

**Special Contribution By**

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**August 1974**

**U. S. ARMY AEROMEDICAL RESEARCH LABORATORY**

**Fort Rucker, Alabama 36360**

**U. S. Army Medical Research and Development Command**

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## ABSTRACT

The U.S. Army Aeromedical Research Laboratory has supported the helicopter medical evacuation mission throughout its rapid growth. The concept of dedicated evacuation helicopters and crews has been well proven during the Vietnam Conflict. Concurrent with this development has been the rapid emergence of the civilian emergency medical services within the Continental U.S. The utilization of the military helicopter in a joint role with the civilian community, the Military Assistance to Safety and Traffic, as well as in its combat evacuation role requires combined emphasis and upgrading of medical equipment and procedures.

This conference represents a unique approach to the problems of maintaining pace with the rapid developing field of aeromedical evacuation. The informal seminar structure provided the helicopter unit, the user, an opportunity to discuss problem areas of medical and operational needs with the U.S. Army Aeromedical Research Laboratory, the developer. In addition, this conference represented a first in bringing together operational helicopter unit personnel from both the U.S. Army and the U.S. Air Force to discuss common problems.

The concepts, ideas and suggestions presented should insure the continued improvement of medical equipment and techniques to provide the highest degree of medical care to the U.S. Military Forces.

APPROVED:

  
ROBERT W. BAILEY  
Colonel, MSC  
Commanding

## **OPENING REMARKS :**

**Major General William J. Maddox, Jr.**  
**Commanding General, United States Army Aviation Center and Fort Rucker**

In June of 1971, I had been Director of Army Aviation for about a year when I made my commitment to the Military Assistance to Safety and Traffic (MAST) program. I examined the interim test report that had been written some few months before, talked to people around the Pentagon, and decided that MAST was well within the capability of Army units to handle. The fact that there would be a helicopter available with competent crew on a full time basis was enough to make the MAST program attractive to me as a commander.

I concluded that the MAST program was in line with the readiness objectives we have for Army units because it provides a method of giving our people an opportunity to have a life saving and operational mission as opposed to a routine training mission. It's a lot harder to get people up for realistic training than it is to run an operational mission that is real and rewarding regardless of what the weather conditions may be.

The MAST business has been a long time coming on line; basically because we had to get some legal backing beyond the scope of the limited test that was conducted at five pre-selected Army and Air Force sites. We now have that legal backing. It is interesting to note that our representative in this part of Alabama, Congressman Bill Dickinson, was the one who ramroded MAST through the House Armed Services Committee and helped make the MAST program a reality. He did that without encouragement from people in the Army. When I discussed it with him over a period of several years, his emphasis was on improving local emergency medical care. I believe that he was reflecting the needs of the community for a service which was within our means and capability to provide.

General Abrams went to Congress in 1973 to testify for the 1974 budget. He agreed to MAST, but pointed out that there were some limitations that must be recognized. He published these limitations in a paper on the 12th of December 1973 in which he made six points. The first of his concerns was that it be made clear that MAST must be considered only a supplement to local civilian emergency medical services. Second, the civilian community must not grow to rely on MAST, but keep it in the proper perspective as a supplement to the resources

in their own communities. Third, caution is necessary so as not to overreach the Army's capabilities, because we must consider it to be counterproductive not to be able to deliver. Fourth, we must bear in mind that the military mission is paramount and the civilian community must also understand this. Fifth, the possible encroachment of such a program on private enterprises is a known pitfall and one that must be guarded against. I am sure each of you recognize that at least one civilian aviation (helicopter) association is probably the greatest opponent of the military in getting involved and providing this aero-medical service. As long as the association considers us competitors to its business opportunities, its membership will continue to be our opponents. Sixth, and lastly, the highest command levels of the military must monitor the program closely to assure that adequate safeguards are maintained.

These are all cautions and tend to be negative cautions, but I think that when we understand what these cautions are, we can then look at the MAST program for the positive advantage it offers through the great benefit to the people it assists; for the advantages in readiness that it will provide to us in the military services; and for the extra motivation derived by the Army because we are serving our people and our country in a most altruistic manner. These are all four good reasons why we must do a good job with MAST.

Now I know you are gathered here to discuss some of the more technical aspects of medical equipment and operational aspects of our helicopter air ambulance, but I want the MAST commanders and everyone here to know that the Army supports the program. We want to do everything we can to assist the local communities through Army service. It is a difficult task, but a most worthwhile task. I wish you good luck in your conference, and I hope that it paves the way for improved medical support for our combat troops as well as the local communities.



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**REVIEW OF THE U.S. ARMY AEROMEDICAL RESEARCH LABORATORY  
CONFERENCE ON AEROMEDICAL EVACUATION  
15-16 JANUARY 1974**

**INTRODUCTION**

The employment of the helicopter air ambulance in medical evacuation has been a well proven concept. The mortality of the wounded soldier admitted to medical facilities in Vietnam was 2.3%.<sup>1</sup> The effect of considering the number of deaths with those wounded reflects those reaching a medical facility who otherwise would have been considered killed in action. In WW II, 27% were killed in action or died after admission; in Korea, 22%; and in Vietnam, 17%.<sup>2</sup> These figures are a striking indication of the effective management of the trauma patient. The helicopter has been a primary factor in this success. With the proven results in Vietnam of rapidly moving a severely wounded combat casualty to a well equipped, well staffed medical facility within approximately 15-35 minutes,<sup>1</sup> the 17% figure would appear to be reducible only by providing improved medical capability during the earliest phases of evacuation.

**BACKGROUND**

The rapid, immediate removal of a trauma patient from a life threatening hostile environment is termed "rescue." This rescue is required in combat due to enemy action and in peacetime, from the accident area. The patient must be considered unstable and at the lowest echelon of medical care. He is moved by air ambulance to the next level of medical care, i.e., military surgical hospital or civilian hospital. The patient's entry into the helicopter in and of itself increases the possibility of salvage of life and limb.

The phase of resuscitation and initial stabilization must then be considered. Resuscitation or life saving emergency treatment may have been accomplished on the ground, condition permitting, or may be required in the initial transport phase. This action would appear to have the greatest impact on continuing the decrease in mortality statistics.

The air transport of combat or peacetime casualties from the initial medical treatment facility to more definitive hospital facilities must be considered as the next phase of medical care. In this situation the patient's

entry into the helicopter must maintain the level of medical care rather than increase his risk by exposure to a lesser medical capability.

The U.S. Army Aeromedical Research Laboratory (USAARL) has directed effort at upgrading the medical equipment available to the helicopter air ambulance aidman and developing appropriate items to maintain the pace of the rapidly advancing emergency medical care field. Of equal or greater importance, USAARL must assure proper interface of this improved equipment with the air ambulance helicopter.

To meet this requirement a conference on Aeromedical Evacuation was held at USAARL, Fort Rucker, AL, on 15 and 16 January 1974. The purpose of this conference was to provide direct communication between the USER--the helicopter air ambulance unit--and the U.S. Army Aeromedical Research Laboratory--the DEVELOPER.

The following discussion reviews and coordinates the comments of the participants in this open seminar type conference. To provide a readable format, the author of this report was required to edit and select the primary areas discussed. The author accepts responsibility for the interpretation of the remarks presented.

## DISCUSSION

### U.S. Army Aeromedical Research Laboratory

The development of medical equipment and procedures for use in the tactical medical care system and interhospital transfer system of helicopter air ambulances is a project of USAARL. The efforts of this laboratory are to maintain pace with the rapidly advancing technology in the field of emergency medical care.

Research support is offered to all participants in helicopter/fixed wing air ambulance operations. This may be provided by any of the following means:

- 1) USAARL has the capability to assist units or individuals with the experimental design of studies.

2) USAARL can provide equipment, statistical evaluation, or other ancillary support to accomplish the research effort in a unit or in the individual's own facility.

3) Units or individuals may request USAARL follow-up evaluation of any experiment or development efforts conducted at unit level.

In all these situations, the U.S. Army Aeromedical Research Laboratory mission is to support the operational unit.

#### Office of The Surgeon General

Problem areas inherent in the current operations of the U.S. Army helicopter air ambulance units were presented. The need to prepare guidelines for the overall medical requirements of air ambulances in this area of rapid development was stressed. The need to upgrade and standardize the equipment, in addition to a standardization of procedures, is essential.

The need for an MOS career field for the air ambulance aidman was emphasized. The loss, due to lack of career opportunity, of the highly skilled medical corpsman who is trained to the level of emergency medical technician (EMT) provides poor utilization of medical resources. The need for standardization of training of the medical corpsman to the level of EMT in addition to training in the medical aspects of water, jungle, and varied other environment/climatic conditions was noted. Utilization of sister service schools is considered as a possible adjunct for training.

The problem of chain of command and operational control was reviewed. Units of various posts may be working under a division commander, a post commander, and a medical commander.

The Office of The Surgeon General will have representation on the transportation subcommittee of the Emergency Medical Service Interdepartmental Committee for the Department of Health, Education and Welfare. The purpose of this committee is to develop standards of transportation systems to meet the needs of emergency medical services. This includes efforts to develop such items as:

- 1) Standards for air ambulances to include helicopters and fixed wing aircraft.
- 2) Standards for air evacuation by federal agency helicopters.
- 3) Standards for interchangeable medical equipment.
- 4) Heliport and helistop criteria for hospitals and roadside evacuation.

A review of the justification for procurement of the UTTAS helicopter noted that a medical mission was a primary procurement need. Subsequently, the medical requirement was eliminated due to a cut in funds.

The Helicopter Ambulance Air Crash Rescue Detachment (Team RC) is currently undergoing an operational test and evaluation to determine its further utilization. The Air Force has discontinued the use of crash rescue units based on analysis of past experience.

Direction measuring equipment (DME) is being programmed for all medical evacuation helicopters and will be determined by tail number of the aircraft.

Paint Scheme for Helicopters. To date in the CONUS a few helicopters have been painted totally white. International regulations and TB-746-9312, Change 4, 23 Nov 73, currently require only that a red cross on a white background be utilized. A few units are using the paint scheme of white with a red cross. Directives concerning the final paint standard are to be forthcoming.

#### Military Assistance to Safety and Traffic (MAST), Department of Defense

The MAST uses military helicopters and other resources to assist local and state agencies in the evacuation of persons injured on the highways and in rural areas. Under this program other missions are flown, i.e., transfer patients from small community hospitals to large medical centers. "The MAST program is intended as a demonstration of aeromedical evacuation techniques and seeks to transfer knowledge and experience to the civil sector, and, when necessary, supply backup support to civil and private emergency medical services." The responsibility for civilian aeromedical evacuation remains with the civil sector. Military support cannot compete with the civil effort nor will it adversely affect the military mission.

Current statistics available on the operations of MAST are shown in Figure 1. These data are provided to indicate the operational flying hours involved in the MAST program.

**MAST OPERATIONS MISSION REPORT  
(6 Jan 74)**

Site	Totals to 6 Jan 74		
	Missions	Patients	Hours
Ft. Carson, CO (6 Aug 70)	503	628	1745.6
Ft. Lewis, WA (6 Aug 70)	763	799	1342.8
Ft. Sam Houston, TX (15 Jul 70)	1056	1177	1605.0
Mountain Home AFB, ID (1 Sep 70)	52	56	110.7
Luke AFB, AZ (1 Sep 70 - 31 Mar 73) (Unit Deactivated)	82	113	178.4
<b>TOTALS</b>	<b>2456</b>	<b>2773</b>	<b>4982.5</b>

FIGURE 1

The question of National Guard unit participation in this program has not been fully elucidated to date.

The current MAST directive under public law authorization deals only with the United States, and no definite decision has been made as to a fully defined MAST program in other countries.

**MAST problem areas reviewed included:**

1) The support provided by the post or facility to the MAST unit which is attempting to provide a 24 hour service. This is in view of the varied directives concerning limitations on work week, fuel, and personnel. It was noted that congressional interest in the MAST program has committed the US Army to actions requiring increased effort on the part of all the aviation and medical resources.

2) The medical liability question for the individual performing within the scope of his duties was felt to be covered under the Federal Torts Claims Act. The current operational feeling is to handle lawsuits as they may arise on an individual basis. One lawsuit is currently pending.

3) The problem of adverse community relations when a MAST unit is moved or is deactivated at a given military facility was averted by adequate planning by the civilian community. This was exemplified by the movement of the US Air Force Air Rescue and Recovery Service Helicopter Unit from Luke AFB, AZ. In this case, the civilian community, upon realizing that the MAST service was to be terminated, subsequently established their own aeromedical evacuation service.

4) A film is reported available concerning MAST utilization. It is anticipated this film will be available to the participating helicopter units at a later date.

5) The procurement of equipment by expansion sites was reviewed. It was noted that most communities are attempting to provide medical equipment and communication gear in coordination with the local area and the helicopter units. Adequate maintenance by the civilian community of the radios after installation in the air ambulance frequently produces a problem. The problem of communication equipment was well recognized as an area requiring emphasis to avoid difficulty.



**CONFERENCE DISCUSSION WITH  
HELICOPTER AIR AMBULANCE UNIT PERSONNEL  
PARTICIPATING IN THE MAST PROGRAM**

**507th Air Ambulance Company, Ft. Sam Houston, TX**

The unit's primary military mission includes support of Brooke Army Medical Center, the Institute of Surgical Research, the Academy of Health Sciences, and the MAST program. This unit represents the pioneer unit in the field of MAST. It currently has 13 aircraft located at Ft. Sam Houston, and approximately 40 aviators. A review of the operational environment indicated that 60% of the flying hours were accomplished during daytime and 40% during nighttime. A total of 1604.4 hours of flying was accomplished in 1055 missions. It was noted that on many occasions the aircraft would fly VFR to the pick-up site and frequently IFR on a return. The operational considerations encouraged this to avoid the low-level wire strikes or other dangerous conditions with patients on board.

It was pointed out that a significant number of accidents involve treatment of the individual at the roadside by rescue squad and/or ambulance service with subsequent movement to a small hospital. The request is then made for the air ambulance service to move the individual from the small hospital to a larger medical center. The MAST mission thus takes on the position of interhospital transfer. Ninety-three percent (93%) of the 507th operations are interhospital transfers.

Occasionally, the requesting hospital indicates its desire to place a nurse on board the aircraft, especially with the transport of infants in incubators. This unit notes whenever possible they suggest a nurse not be placed on the aircraft. This unit notes from their experience that the nurse usually arrives at the helicopter anxious and excited. This results in her making mistakes such as closing the incubator lid on the oxygen hose. This frequently requires the onboard medic to assist her. (Note: It is pointed out that the requesting physician may consider the nurse a competent medical attendant as required by MAST operating directive. The use of a U.S. Army/USAF type "flight nurse" interested, enthusiastic and trained in aeromedical techniques must be considered.)

A suggestion was made to mark the crewmembers' helmets so that the aircraft commander can recognize the members of his crew outside the aircraft in the very confusing situations that exist at rescue sites and at hospital landing pads.

Equipment. A review of equipment carried aboard the 507th Air Ambulance Unit aircraft was provided. "Plastic" IV bottles are standard equipment. It was noted an aircraft crash utilizing glass intravenous bottles inflicted multiple minor wounds therefrom. It was pointed out that occasionally on arrival at an outlying hospital if a glass intravenous bottle is currently utilized, the medical aidmen will change this IV themselves. (Note: This requires insuring that the IV fluid is the same type to include the possibility of additives in the IV fluids, e.g., antibiotics, other electrolyte mixtures.) An ambu resuscitator and aspirator (FSN: 6515-00-890-1818) is carried. A Green splint assembly, full body, rescue and transport (FSN: 6515-00-405-5391) is carried. Suction equipment is locally purchased (See Equipment Summary). A miniature cardiac monitor providing audiovisual signal is carried. Evaluation of this device is being planned at USAARL. Two standard medical oxygen bottles are carried aboard the aircraft.

Procedure for Mission Requests, Both Military and the Civilian MAST Mission. The 507th program does not include a flight surgeon in its emergency medical mission request. The reason given is that the flight surgeon is too busy taking care of the aircrewmembers in the clinics. The question of whether a physician is needed on board remains relative to the particular situation discussed. When a mission request is made to the aircraft commander or the operations officer and there is a question of justifiable mission, a flight surgeon or other physician will be consulted. It is the current philosophy of the 507th that they should be on the offensive rather than the defensive. It is felt that when a request is made, full effort should be made to pick up the patient. If, at the conclusion of the mission, it was felt that the request was not justified, the commander or the operations officer would return to the civilian community and discuss the problem with the requesting physician or to the Alamo Council of Governors, which is the primary medical input to MAST. A discussion would also be held with the administrator of the offending hospital. In the case of the 507th the unit commander deals primarily with one man, an administrator and not a member of the MAST Coordinating Committee. It was noted that a doctor was a member of the Coordinating Committee but was not utilized. (Note: It is recommended that physician to physician discussion of a MAST mission would be preferable as opposed to requesting a hospital administrator to take action toward a specific physician.)

With the initial establishment of the local Coordinating Committee, a physician was included to support the helicopter ambulance units and assist them

in making decisions far beyond the scope of their training. In this light, if it was found that the civilian physician was "unloading" patients to the larger hospitals, then the civilian physician representative could take appropriate action. An example would be a routine review mechanism of patient movement followed by a visit to the hospital administrator and physician to insure adequate utilization of the service being provided. The intent was to allow peer review and maintain civilian to civilian contact in the MAST program. It was noted that a recent message concerning MAST operations required the civilian physician or competent medical authority to accompany the critical patient. It was pointed out that this individual, when he is present on the aircraft, assumes primary patient responsibility.

The question of aircraft commanders, operations officers, or unit commanders discussing the problem of patient evacuation with a requesting hospital or physician was felt by this unit to be based on the individual case. The need for a physician assisting mission identification and assuring proper channels were utilized was felt to be indicated again on a case by case basis.

The problem of the responsibility of the aircraft commander to accept a patient from a doctor at an outlying hospital was presented. A problem area is the aircraft commander's responsibility if the attending physician has requested an air evacuation move for a totally unstabilized patient. It is noted that the attending physician who places the unstabilized patient on the helicopter accepts the primary responsibility for his care; however, he is transferring some measure of that care to the medical capability of the system and in some measures under the auspices of the federal government, the US Army. Discussion indicated that from a legal point of view the aircraft commander must be considered solely an Ambulance Driver at this point in the development of the program.

In the case of rescue and first aid operations, request from a limited level of medical care, such as highway patrolmen, sheriff, or other ancillary law enforcement or civil defense personnel, allows the aircraft commander to accept the unstabilized patient on the urgency of the situation.

In interhospital transfer, the possibility of a smaller hospital transferring a patient to a larger hospital in order to transfer responsibility for a chronic illness, charity case, or similar situation required that a receiving physician at the larger hospital be contacted to insure a bed or capabilities

were available for the incoming patient. The lack of this could easily cause consternation on the part of the aircraft commander when he radioed ahead to the hospital and would be notified that they would not accept a patient. A second measure of handling this situation would be that the Coordinating Committee would establish that certain hospitals would be receiving hospitals for any patients brought in by helicopter. It was recommended that any coordinating group establish this principle within their operating area.

The concept, "Are we doing everything in view of what's best for the patient?" was presented. It is occasionally noted that the physician at the small hospital as well as the physician at the large receiving hospital have no concept of the problems inherent in aeromedical evacuation or the physiology of flight. The need to adequately prepare the patient, stabilize the patient, and insure proper equipment, drugs, and maintenance of the level of medical care obtained prior to movement is noted. It is considered advisable that a consultation should be obtained with an experienced flight surgeon and/or physician familiar with aeromedical evacuation in the movement of a borderline patient.

Medical Procedures in a Helicopter. The effects of motion, vibration, and noise provide an added handicap to the usual medical procedures, such as starting an IV, passing a nasogastric tube, obtaining a blood pressure, intubation, and palpating for arterial pulsations. The problems of availability of space to include storage and working area in the helicopter must be considered.

Training of the Medical Corpsman. Initially, a high percentage of the available air ambulance medical corpsmen were Republic of Vietnam qualified medical corpsmen. The present input into all MAST units is the average medical corpsman graduate from the basic medical training program. The source for the air ambulance corpsman was noted to be only 50% volunteer. A review of the approximate program of the 507th for the arriving basic medical corpsman consists of a week in the Brooke Army Medical Center emergency room, a second week at Wilford Hall General Hospital, and two weeks of on-the-job training in the aircraft to include radio procedures and aircraft operations. A week is then spent at Santa Rosa Medical Center where most of this unit's pediatric patient incubator transfers are delivered, and lastly a week of training at the Bexar County Hospital emergency room for realistic training in acute trauma. The corpsmen attend two hours of classes every week on various medical subjects conducted by physicians and other personnel from

Brooke Army Medical Center and the Academy of Health Sciences. It was noted that the pilots and other crewmembers did not have required training in emergency medical procedures as does the corpsman.

A discussion of the utilization of emergency medical technician courses in the San Antonio area revealed that nine of the 12 air ambulance corpsmen of the 507th have emergency medical technician accreditation. A few of the aviators, although not required, have attended the EMT course. It is interesting to note the University of Texas does have an emergency medical training program; however, most of the corpsmen obtain this training through the New Braunfels Fire Department course, which is recognized as an adequate program. It was considered that one of the benefits of participation in the emergency medical technician course in association with the local community is that the local civilian medical personnel will identify and develop a camaraderie with the corpsmen attending this training.

It was noted that an EMT course is available in cassette form for home study. A recommendation was made that the Department of Army should obtain a supply of these cassettes and make them available to the individual units participating in the MAST operation and/or other tactical medical care.

A Discussion of the Need for the Aviator in the Air Ambulance Helicopter to be Trained in Emergency Medical Techniques. The problem of whether the aircraft commander would be called upon to make medically oriented decisions was presented. It was suggested that upon arriving at the scene of an accident in a rescue type recovery, with four persons aboard the helicopter, it may require all four to provide lifesaving support to a number of patients at the scene. The number of people involved in such an accident is to be considered. The problem of shutting down the helicopter and all members assisting in treating the injured was discussed. This must be considered in the light of rescue operations where all four individuals could provide emergency first aid and at such time as directed by their own air ambulance corpsman could evacuate the more critically injured. Under today's standards, only one man of the four individuals in a helicopter has even limited medical training. This was challenged by the point of view that every medical service corps officer undergoes a medical training course at Fort Sam Houston, TX, and secondarily, most of the Army medical service corps aviators have a "medical background." The level of medical training for the medical service corps aviator was not defined in full scope. It was acknowledged that when time permitted it would be "nice to have" all aviators qualified in emergency

medical training. (Note: The primary medical corpsman should receive the most extensive training in medical care, and the three additional persons on the helicopter, pilot, copilot and crew chief, must be given at least some degree of emergency care training.)

The problem of operational training versus medical training of the aviator noted that the operational training takes precedence. The limited number of aviators such as found in the small detachments or isolated units would make the time available for medical training in addition to aviation qualification training severely limited. It was noted that a large amount of training requirements are already placed on the aviator.

Other comments with regard to emergency medical training indicated that the state of North Carolina was willing to send the air ambulance medical corpsman to the University of North Carolina to obtain emergency medical training. In California, attempts are being made to qualify both the corpsman and the aviator for the state board requirement for an emergency medical technician. Occasionally the U.S. military medical corpsman with a minimum of review in certain areas has frequently challenged the state emergency medical technician examination and passed without difficulty. This has also been reported for some aviators. (Note: These comments again point out the need to standardize Army requirements for training of the air ambulance medical corpsman to meet all state and local requirements in addition to military requirements.)

The familiarization and orientation of the limitations of the helicopter air evacuation system for the local civilian physician were reviewed. It was pointed out that the original training was done early in the program and that currently a helicopter and crew are spending time in the local community area to brief those physicians utilizing the MAST program. Again, the problem of physiologic problems in even the low level altitude operations of the helicopter was recommended to be discussed with local physicians. It was noted that San Antonio is the center of U.S. Army Military Medicine with the Academy of Health Sciences and Health Services Command, as well as the U.S. Air Force School of Aerospace Medicine. (Note: Utilization of these assets is strongly recommended.)

Rescue Equipment. A helicopter rescue net and a sea rescue device have been utilized by this unit. Evaluation is being undertaken to determine applications to tactical operation. The problems of hoist operations were reviewed. Hoist operations throughout the helicopter air ambulance operations have been

sharply curtailed. "Life or death" is currently the criteria for hoist usage. A recent death in September 1973 due to cable breakage while hoisting an individual from a relatively inaccessible site has placed this life and death criteria on hoist usage.

Problems are noted with the current hoist. The difficulty in obtaining hoist replacement and the lack of a definite time at which the cable should be replaced after a given number of hoist operations are areas of concern. Repair and replace capability for cables and/or parts of the hoist has proven to be extremely difficult.

The use of the Forest penetrator has occasional difficulties usually involving those civilian personnel unfamiliar with its operation. Additionally, consideration of danger to the air ambulance corpsman who may enter a hostile area and/or environment to assist a panic stricken civilian in use of the penetrator is to be considered.

#### 54th Medical Detachment (RA), Ft. Lewis, WA

The 54th Medical Detachment, RA, of the 62d Medical Group is stationed at Fort Lewis, WA. The command structure of this RA Detachment is that of working under the 62d Medical Group and subsequently under the post commander. The detachment does not have direct input from Madigan Army Medical Center. This unit does, however, have access to physician consultation which includes the emergency room physician, pediatricians, and flight surgeons on call.

A civilian physician is the primary medical input in the control of the MAST operation. This physician is a surgeon located in Seattle, Washington, approximately 50 miles away. There is some difficulty experienced in contacting the physician even though he does carry a page radio. This unit attempts to contact this physician on nearly all cases; however, if contact is not established within five minutes, and the mission is judged valid, the aircraft commander or the unit commander will accept the request. It was noted that the unit does not have to justify missions that are rejected. The reason for this is that the consulting physician is usually on the phone in cases of rejection and enters into the discussion. Occasionally, the unit is being bypassed with the request going directly to the consulting physician, and he is in turn not accepting the mission without consulting with the aviation operation considerations. An example is a physician in Seattle noting a few

clouds and determining that the weather conditions would be too bad for the flight. This problem should be handled by the Coordinating Committee; however, the Coordinating Committee for this area does not meet on a regular basis. The importance of regular and consistent meetings of all Coordinating Committees was emphasized.

Helipad Criteria. The problem of patient transportation from available helipads to the receiving hospitals was presented. The situations varied widely as evidenced in one pad being on the roof of the hospital and another pad being in an adjacent field which required subsequent ambulance movement of the patient for about one-half mile. The movement in the second example is by a commercial ambulance company; not a rescue company. (Note: This raises a question as to level of medical care in "routine" commercial ambulance and the medical/legal transfer of patient care to competent or responsible medical personnel.)

The Federal Aviation Agency requirements for heliports were reviewed. The problem of providing a service and forcing the local hospital to come up to acceptable heliport standards is plaguing all aeromedical evacuation operations. It is difficult to stop service to helicopter landing pads that have been used for a few years and suddenly require the civilian hospital to improve the heliport to meet FAA standards. Friction between the military and the civilian community would be created easily in this area. It was recommended that those helicopter air ambulance units being given a MAST mission insure that they consider this problem.

By a regulation from FORSCOM the unit commander and/or safety officer are required to inspect all heliports and physically walk over them once per month. For the 54th Detachment that includes 80 helicopter pads plus the Gray Army Airfield pad. It is apparent that this would be a full time job for one helicopter and crew.

Field Sites. An operational problem was reviewed, which is that of field siting a single helicopter in an isolated area, in this case the Yakima Firing Center. The problem in the Fort Lewis area centers around the fact that during the summer training months, the Yakima Firing Center has a significant military population. Satelliting a helicopter for their aeromedical support meets the military mission. However, this unit is well known in the state of Washington to have a MAST mission, and therefore when the helicopter arrives it is considered by the local populace to fall under the MAST



directive. This produces a difficult position politically in attempting to pull this helicopter back upon conclusion of training. Other helicopter units reported a similar situation.

Mission Requests. This unit deals with approximately 80 hospitals with 40 on each side of the Cascade mountain range. There are approximately ten receiving hospitals on the western side and about four on the eastern side of this range. It would appear that the percentage of interhospital transfer is approximately 50% and rescue 50%. The request for patient movement comes from approximately 11 different organizations. This ranges from the state patrol, fire chiefs, local sheriffs or law enforcement agencies, small island communities, the National Park Service, and lumber corporations. An operational consideration is that the major portion of rescue that this unit is involved in is primarily into the mountains and woods, i.e., the backpacker and hiker. The medical corpsman aboard the aircraft frequently provides the initial first aid on many occasions. It was noted that medical corpsmen occasionally are required to splint fractures. The medical/legal question of the authority to start intravenous lines was noted not to have been fully defined.

Training of the Air Ambulance Aidman. Most of the medical corpsmen of this unit have no experience from Vietnam. A senior 91C medical corpsman is considered as the senior NCO and training instructor of the more junior personnel. He is not an assigned individual and is currently on loan from the 62d Medical Group. The training program utilizes the availability and proximity to Madigan Army Medical Center for equipment and instructions. The book Civilian Transport of Emergency Medical Care Patients by the American College of Orthopedic Surgeons is utilized as a primary guide.

Communications. The communications problem: utilizing initially installed radio equipment (Motorola Dispatch Radio) from the civilian community was that the helicopter picked up all emergency service communications which included fire, rescue, and police traffic. Difficulty with the civilian owned radio equipment maintenance was also noted. This unit has at present reverted to handheld radios for communication. One radio is used for contact with the state patrol. The other radio is used for contact with the Department of Emergency Medical Services, Search and Rescue.

The problem of handling a patient that deteriorates in flight is usually accomplished by FM communication to the ground, through flight service,

or through unit operations to the surgeon in Seattle (the MAST physician). If necessary, they have occasionally landed at some intervening hospital to obtain assistance in stabilizing the patient. Occasionally, the aircraft is shut down. A doctor from an intervening hospital has on occasion joined the crew in order to complete the flight as required.

Interservice unit training has been effected with the Coast Guard for over-water operations. The points of training include how to maneuver a boat with the rotor wash, and the use of the hoist with personnel and patients out of water. This unit occasionally supports the Coast Guard by providing support into the mountains when there is an excessive number of backpackers and hikers. The Coast Guard helicopter does not have enough power to fly into these mountains without leaving behind a large amount of its fuel and a majority of its radio communications gear.

Equipment Review. A review of equipment carried by this unit notes an increased amount of survival equipment for the helicopter and aircrewman. One over-water survival kit and three cold weather survival kits are standard items. The ambu resuscitator, four oxygen bottles, medical equipment stored in a foot locker, a Stokes litter, Hare traction splints, the military anti-shock trousers, and the two handheld radios are carried. The Madigan Army Medical Center provides this unit with a portable incubator as required. A special backboard was also noted to be available from the local ski patrol. Plans will be obtained for this backboard in the future. A hoist is usually prepositioned on the number one or number two aircraft. The need for a portable suction apparatus has been noted by this unit. This unit also utilizes an ECG monitor and an ECG machine. (Note: The utilization of this equipment by the air ambulance corpsman on board must be part of the overall medical management of this patient in an interhospital transfer with radio communication with a physician to direct therapy based on ECG monitor data.)

The problem of selecting the medical equipment to be placed on board and secondarily who purchases it for this unit was discussed. The Madigan Army Medical Center has purchased some of the equipment. The MAST Advisory Committee frequently recognizes the need, but has limited funds to purchase equipment for this unit. A problem arose in this area in that the MAST Advisory Committee was taking the air ambulance reports with the patients' names and writing a letter requesting money for the support of the program. This was being conducted without the knowledge of this unit.

and subsequently terminated at the insistence of the unit. It is reported only to serve as a warning for other MAST units encountering this type of civilian enthusiasm.

The paint scheme on aircraft was again addressed, and this unit posed the difficulty of seeing the completely white air ambulance aircraft against the background of snow and clear light blue sky. It was suggested in this area of operation, the OD painted aircraft has greater visibility. Additionally, the use of the blade paint scheme and Xenon lamps should improve conspicuity.

The development requirement by the Navy and Coast Guard to utilize bladders of the standard LPU and have them attached directly to the standard survival vest was suggested for use by the U.S. Army. This development reduces the number of straps and/or zippers which must be disconnected for getting in and out of an aircraft in an emergency and in routine operations in preparing for flight. (Note: A report of this has been requested from the U.S. Navy.)

A problem of determining the position of the medical aidman in the aircraft and his ability to adequately strap in was noted.

Weight and balance calculation is also an operational area requiring review by all units. In order to provide adequate balance for the current loading position of this unit's aircraft, a recent move of the battery to the nose compartment was noted.

Detachment 22, 43d Aerospace Rescue and Recovery Squadron, Mountain Home AFB, ID

The USAF is operating with UH-1N model helicopters. Previous UH-1H models had communications equipment which included UHF, VHF, two FM radios, tacan VOR, and two kinds of ADF. Utilization of the UH-1N model resulted in less radio equipment and smaller cargo area.

Command lines for this unit are by operational control by the Commander of the 366th TAC Fighter Wing (F111). The primary command structure is from the unit to the 43d ARR Squadron at Richards Gebaur AFB, Missouri; subsequently, to the 39th Air Rescue Wing at Eglin AFB, Florida; and to the Military Airlift Command Headquarters at Scott AFB, Illinois.

Mission Request. A request for a MAST mission comes directly to the command post at Mountain Home AFB. The command post then establishes a conference call which includes the requester, the aircraft commander, and the base doctor.

If a request should occur during non-duty hours, the medical officer of the day at the hospital is included in the call. It is well recognized that the problem in this situation is that this physician may be totally unfamiliar with the helicopter operations and is being required to make decisions of an aeromedical nature. It was also stressed that if there is any delay in the command post obtaining a doctor in the conference call, the aircraft commander would determine if the mission were legitimate.

It was repeatedly acknowledged that a flight surgeon or a physician fully familiar with the capability of the aircraft and the aeromedical system is of utmost importance. This unit noted the fact that the flight surgeon, if he rides as a member of the crew on that helicopter, must be trained to operate the hoist and other parts of the helicopter by Military Airlift Command directives. (Note: This unit was encouraged to actively seek and encourage the flight surgeon's participation in all aspects of aeromedical evacuation. By this education and support the primary call for medical support can be made to the most knowledgeable physician available.)

In order to determine whether or not a "true patient save" had occurred, follow-up effort through the physician in the emergency room or the patient's primary physician as to the impact of the aeromedical evacuation mission is obtained. In this unit's case, they utilize one primary hospital in Boise, Idaho; therefore, this type follow-up is more readily obtained than most other units.

Training of the Medical Corpsman. The USAF pararescue corpsman training program was reviewed. It includes six weeks of medical training at Sheppard AFB, Texas, followed by 11 weeks at Eglin AFB, Florida. This includes triage, laboratory work using goats, and six months of medical training. These corpsmen are tested annually by the flight surgeon at his discretion. The "qualifications" of the USAF paramedical corpsman were noted by this unit to be: minor surgery, such as suturing, venous cutdowns, and surgically opening an airway by cricothyroidotomy or tracheotomy. This unit also considered its individuals capable of performing thoracentesis. Additionally, the pararescue man is Army parachute qualified and Navy scuba

qualified. These individuals have attended the mountain climbing school and all Air Force survival schools, to include desert, sea and jungle. The USAF has a career field for the pararescue medical corpsman. (Note: USAF personnel in attendance were surprised to find that the most senior rank available to the U.S. Army medical corpsman on the helicopter leads only to the level of E5. It was pointed out that by the time the U.S. Army medical corpsman reaches that level and is trained, he is usually returned to the hospital and enters a standard career of a hospital corpsman.) The maintenance of the level of medical care cannot be decreased from the first institution to the next receiving hospital. This requires the medical corpsman to be capable of administering drugs, resuscitating, or responding to a physician's orders by radio communications. The USAF paramedic would appear to represent this desirable level of proficiency.

Operational Missions. Approximately 50% of this unit's missions are rescue. In these cases, the pararescue man is the first competent medical person actually on the site. About 10% of this unit's calls are auto accidents. The unit operates on a 24-hour basis with a total unit strength of 24 personnel. There are five aircraft commanders, three copilots, three pararescue men, three flying mechanics, seven maintenance men, one engine man, and one administrative man. The standard flight crew is two pilots, a pararescue man, and a helicopter mechanic. The unit utilizes a system of limited call at night, allowing the helicopter aircraft commander and crew to remain at home with a longer response time. The response time for the night operation is approximately 30-45 minutes. During duty hours, the response time is from two to ten minutes. At present radio pagers are being sought for use of the duty crews to improve response time.

Equipment. This unit carries water survival gear, asbestos gloves, goggles, portable spotlights, and emergency radios. It was pointed out that standardization of the equipment allows well trained individuals to locate by "feel" the equipment as required without lights. The air rescue medical instrument and supply set was presented (FSN: 6545-935-5890, medical instrument and supply set, Aeromedical and Recovery Team, lightweight). A forest penetrator is usually carried. At present, a small lightweight liquid oxygen system is being obtained from Brooks AFB for evaluation. Other medical instrumentation is as designated by the physician or pararescue man. This unit is at present modifying its UH-1N model with additional fuel tanks in order to increase its range and capability.

### 571st Medical Company (Air Ambulance), Ft. Carson, CO

Operations. This unit operates in an area surrounding Ft. Carson which includes mountainous terrain. Frequent missions require altitudes of 10-15,000 feet usually occurring west of Ft. Carson, CO. The unit is assigned to the Fourth Medical Battalion, operationally controlled by the MEDDAC Commander, and additionally, the airfield commander has an effect on aviation maintenance and safety items. The unit is staffed with 17 aviators. Only five of these pilots have been helicopter pilots in Vietnam. A portion of the aviator training program includes mountain qualification training. At present, only one man is capable of providing this training. Prior to operating in the mountains and landing in those areas, there must be an entry on the aviator's Form 759 showing that he has completed the mountain course.

Communications are a significant problem for this unit. In flights to the west of Ft. Carson, there is no flight service or ADF/VOR capability. This unit does have communication with the police via a Motorola radio. There is, however, no maintenance funds available for this radio. High frequency radios are suggested to improve overall communication capability.

It was frequently pointed out that this unit's mission requirements include flights at an altitude of 10-15,000 feet. An oxygen system has been developed by this unit and will be evaluated by the U.S. Army Aeromedical Research Laboratory. The oxygen equipment is currently being maintained by Lowry AFB, CO, life support personnel for this unit.

Medical Training. This unit's air ambulance medical corpsmen are being trained in an emergency medical training program conducted by Dr. George Weber from the U.S. Army Hospital, Ft. Carson, CO. This physician is a fully trained surgeon and soon to be a qualified flight surgeon. He insures the medical personnel have a continuing educational program. The medical corpsman in interhospital transfer enters the hospital for the purpose of receiving a briefing from the attending medical personnel. This is accomplished prior to placing the patient on the helicopter. At the receiving installation, an attempt is again made to transfer the patient to competent medical personnel, even if this requires shutting down the helicopter and entering the hospital to insure an adequate briefing. Follow-up information on the patient after delivery to definitive medical facility is obtained. This includes information as to his care, both pre- and post-helicopter flight. Additionally, a critique of what the referring physician could have done to expedite or otherwise improve the patient's medical care, as well as what the air ambulance

corpsman could have done to improve his in-flight care, is reviewed. These critique sessions are conducted for the entire aeromedical team on a regular basis to review all cases carried by the unit.

**Medical Equipment.** This unit utilizes a resuscitator/aspirator, field (FSN: 6515-926-9157). This has been modified to operate in the helicopter. The air ambulance corpsmen are well trained in the utilization of this resuscitator. A Gomco standard suction device has been modified to utilize aircraft 28 volt DC power. A Doppler blood pressure monitoring device is being utilized by this unit. Evaluation of in-flight blood pressure monitoring devices of this type is ongoing at the U.S. Army Aeromedical Research Laboratory. The use of plastic bag intravenous fluids was again suggested. Additional equipment, such as monitors, defibrillators, and intubation capability, is carried when a physician is on board and capable of using this equipment.

**Mission Request.** This unit operates under the criteria of an immediate response to air evacuation call. In the rescue situation, this would be acceptable. However, in the interhospital transfer situation, this unit again noted that the clinical condition of the patient remains the referring physician's responsibility. In interhospital transfers, the unit continues to operate on an immediate "you call, we haul" basis. A specified physician is, however, a part of the approving authority in the interhospital transfer. Currently, when the unit operations is contacted by a physician, immediate contact is established with the surgeon for the conference call. This is a unique operation at Ft. Carson, CO, whereby communication is continually available by handcarried radio. The radio communication system keeps the surgeon or his principal assistant in constant communication with the helicopter air evacuation operation 24 hours a day, seven days a week. This represents a standard to be sought by all units. Additionally, as the skill level for the unit helicopter medical corpsmen increases, the level of medical care available in the helicopter will be increased by radio communication with the physician.

**Training of the Medical Corpsman.** The unit's teaching program includes basic resuscitative measures and evaluation of the patient at the scene. With this type training, it is expected that a corpsman could explain by radio to a physician a significant amount of information necessary in determining management of the patient. Upon the completion of this course, the corpsman at Ft. Carson, CO, will be emergency medical technician qualified for the state of Colorado. It is pointed out that improving the skill of these corpsmen,

up to and including intubation of live patients in the operating room, is still being sought. The responsible physician acknowledges that until the corpsmen are qualified by medical/legal determination from the U.S. Army to give drugs, intubate, or defibrillate in the aircraft, he is unwilling to direct his corpsmen to do so in flight.

The concept of utilization of military nurses in air evacuation helicopter operations was presented. At Ft. Carson, a group of interested nurses have volunteered for training in the helicopter and are requested to fly specific missions. It must be pointed out that this is on a purely volunteer status. The background for the use of a nurse in the helicopter is that they are usually more qualified than the corpsmen in providing services to the patient under standard medical/legal considerations. This includes giving drugs on the direction of the physician and performing other resuscitative measures. This unit additionally feels strongly that a training program for the physicians associated with emergency room practice in aeromedical evacuation should be instituted.



## **OPERATIONAL EXPERIENCE OF A CIVILIAN RESCUE SQUAD**

**Eugene L. Nagel, M.D.**

**Physician in Charge, City of Miami Fire Department-Rescue Section**

I thank you for the privilege of attending this conference on military evacuation techniques as applied to the civilian environment. As a "medical" type I am obviously outnumbered by helicopter evacuation operations and flight personnel. My experience is with a modern day civilian emergency care system (City of Miami Fire Rescue). We offer advanced care via trained paramedics connected to medical control by radio telemetry systems. It is my belief that principles learned in either the civilian or military arena may have universal application. The proof is in preliminary or demonstration testing followed by controlled full scale implementation programs which are evaluated in a careful prospective manner.

The importance of evaluation cannot be overemphasized. It provides answers to questions such as:

What good is the program?

Should it be continued or expanded?

Is it accomplishing its objective?

Is it worth the cost?

Anyone in a management or supervisory position recognizes the frustration of "knowing" that a program is worthwhile and functioning well but unable to mount credible support facts and statistics.

Miami's emergency care depends upon the fire department rescue section which had been delivering basic first aid to the city for 30 years. We built advanced care onto this system in stages. Men were trained in recognition of disease and injury states, use of defibrillators, drugs, monitoring and telemetry equipment. Gradually the different modalities of care were introduced with medical observers usually being present during the first application attempts. Records were considered as a necessity; they aided in the orderly transfer of information from the pre-hospital to emergency department, permitted evaluation to be carried out, i.e., what conditions were found, treatment carried out and result of emergency treatment. These records then

translate into the evidence for supporting the "good that the system is doing." This cost versus effectiveness tug-a-war that so fatigues the various levels of administration.

We have three men trained to the advanced level riding each vehicle. We attempted to train them in terms of things they were going to do and not in the theoretics that they would not encounter in service. Here is a usual mistake--many people over-train emergency care personnel in procedures they are not going to do which makes credibility and morale go down. Train them for what they will do--make it repetitious--put in written standards--and test them so that you know if the man can do it!

Our crew of three are on duty for 24 hours. They respond to 15 to 25 incidents/day. They cannot roll on 25 bona fide incidents, literally keeping the truck hot for 24 hours, and have continued efficiency. When the service gets that busy we split up the territory and add a truck. Thus, we have gone from three trucks about four years ago to five trucks now serving about 350,000 people.

What type of cases do we see? We see all accidents and trauma, mainly heart attack and the "civilian war." The "civilian war" in the south is mainly bullets. The "civilian war" in New York City used to be predominantly knives. Usually something that penetrates the body constitutes about a fourth of our business. Another fourth of our business is heart attacks or what looks like heart attack. The rest of it is seizure, overdose, hemorrhage, burns, maternity, asthmatic, diabetic, smoke, and heat exhaustion.

What kind of equipment do we carry on the trucks? This is what everybody likes to know--the nuts, bolts, and hardware, and THAT'S THE LEAST IMPORTANT THING! The personnel and their mission and how well they're trained and how well they carry it out--that's MOST IMPORTANT; not whether they have fancy machines with flashing lights, dials and gadgets.

In training our paramedics in the actual procedures, we feel it is important to do these things first in simulation, then on manikins, and finally on living, breathing organisms in the dog lab. We then go to the hospital and practice on patients under supervision and finally to the field. For instance, they learn to send radio ECG's from the dog lab; then to fibrillate and defibrillate the dog. In the same manner they let the heart beat get slow and give it the "speed up" drugs, go rapidly and give it "slow down" or rhythm adjusting drugs. The radio we use is a typical five watt transmitter--receiver

shock mounted in a waterproof case with a signal conditioner or modulator used to transmit the EKG onto a voice-channel tone. In the same case we also keep report forms, electrodes and electrode jelly. We found this more satisfactory than having certain commercially made equipment which is designed by engineers who apparently never got in the field to learn our service conditions. We use the UHF 450 megacycle band where most of the emergency medical care communications ultimately are going to be. There will be decreasing use of the 150 and 50 m Hz bands for emergency care and telemetry purposes.

When voice communications are directed toward the hospital it is commonly utilized for logistical purposes, i.e., type of injury, will arrive at a certain time, etc. It is a relatively new concept for medical directions from the hospital directed to the field paramedic. The necessity for training the emergency care physician in the overall EMS system should be apparent. This training should involve responsible physician and nurse personnel "riding" the pre-hospital elements so they are conversant with field conditions.

It is common for hospitals in the civilian arena to compete with each other, especially if bed utilization is marginal or low. This may lead to an inordinate number of hospitals desiring "base station" status. This in turn may lead to crowding, confusion, and diffuse channels of authority. A possible solution is to demand base stations to acquire not only equipment but also trained personnel, achieve a satisfactory operational status and perform according to minimal performance standards. Hospitals not meeting these requirements may have receivers for notification but cannot direct emergency operations.

A review of Miami traffic in terms of hours of the day is of interest. We have a peak from 9:00 to 11:00 in the morning, from 1:00 to 3:00 in the afternoon, and from 5:00 to 9:00 in the evening, and very few calls in the middle of the night in an ordinary urban system. This is a typical emergency care profile in terms of frequency of call. Thus, when a call comes in the middle of the night, it is generally significant whereas at other times of the day it may be last week's flu case and the patient finally decided to take off from work to seek medical care.

Let us consider the saving of a life. When there is such a "save," we try to bring the rescue squad and the victim together at a later convenient time. This is very beneficial to the squad's morale and education to see someone that they've actually worked on, who was clinically dead, and who is now alive. This gives the men a boost in terms of motivation. We now have 43 cases of these "dead" individuals who are now alive.

To review evaluation, I'll show you how misleading the numbers can be. I'm going to talk about what I call the top of the iceberg, meaning the people who fall over dead proven with electrocardiograms. Let us start with 33 months and medical runs during that period was a total of 20,000. We transmitted cardiograms on 2,200 cases. Let's look at these 2,200. There were nearly 1,400 of them essentially normal and 340 ventricular fibrillations thus clinically dead. Of these 340 we were able to convert to a good heart rhythm in 200 of them. How successful were we? Two hundred (200) of the 340 is 67%. Is this the answer? Let's continue to ask questions of our data. How many of those people made it to the hospital and were admitted? Actually, only 80 of them got admitted to the hospital. Now we have 80 of 340. Our total saved is now only 20%. Of the 80 that were admitted, 20 died in cardiogenic shock, and of the 80 that went in the hospital 40 came out. Should we talk about 40/200, because there were only 200 that started? Should we take 40/80 or should we talk about 40/340? What number do we want? How many of them are alive today? I have to admit that 20 of them died over the last three and a half years. The average life survival was eight and one-half months after the initial fibrillation. Five of them had a second fibrillation and were again resuscitated. We have one patient that fibrillated three times. It's complicated isn't it?

Why do I talk about the top of the iceberg? We shouldn't restrict our analysis of benefits to just living or dying. We should also include the patients in whom we intervened correctly before they went into shock or other potentially lethal condition. Thus, benefits should include more persons alive, fewer operations, complications, days in hospital or intensive care, etc. Now the benefit can begin to justify a high quality emergency health care delivery system. How can we carry out such an analysis? One way might be to look at "tracer" type injuries, those easy to identify and follow. For instance we might consider a hundred fractured femurs admitted to Jackson hospital. Consider 100 fractured femurs treated by the EMS system. This means quick response-IV treatment for low blood pressure or shock, correct stabilization and handling, and rapid and proper turnover at emergency room levels. How many days in a hospital would these patients stay? How many days in an intensive care unit? How many reoperations required? How many infections? Compare these paramedic handled cases with another 100 femurs that are transported by ambulance but which receive no definitive emergency treatment. Most commercial transport systems are more interested in how many miles, how much time, and did they use oxygen. These items form the basis for charges. Thus, if we compared one hundred fractured femurs in the routine transport system in terms of days in the hospital, in ICU, reoperations,

and infections, I would expect a difference. Suppose that the hospital stay was on the average 21 days for paramedic cases and 30 days for the routine transport service on the average. If in this country there are 50,000 such fractures a year this would yield  $9 \times 50,000$ , or 450,000 hospital days at an average cost of \$100/day or \$45,000,000--Quite an impressive estimate for providing correct treatment pre-hospital.

Our rescue incident report form was designed by rescue personnel and an industrial engineer. The problem is to provide simplicity and at the same time the specific data needed to prove that we're operating an efficient system. The form tries to show cause and effect, signs and symptoms obtained, presumptive diagnosis, treatment and effect in a flow type chart (See Appendix B).

Speaking for the U.S. Army Aeromedical Research Laboratory, I want to relate a story about which all of you can be proud. December 1972, I was contacted by LTC Burton Kaplan to demonstrate a counterpressure suit for use in civilian trauma cases. He demonstrated a device that despite its peculiar appearance can be applied in 45 seconds, did not require a water trap as previous devices and encased both legs to the ankle. LTC Kaplan then joined the rescue squad for two or three days. Our first case was a victim in which a safe fell on the patient and crushed both legs. Twenty-seven (27) years old. Blood pressure before the military anti-shock trouser was unobtainable, blood pressure after was 120/70, and the guy woke up. He said, "before I passed out the pain was incredible, but with that thing you have on me, there's no pain at all." He received three units of blood and a fasciotomy of both legs. He recovered with excellent results. The first report of a series of cases was published in the Journal of Trauma, October 1973. LTC Kaplan subsequently took the trousers to the American Medical Association Annual Meeting June 1973 and won first prize with it as a scientific exhibit.

What is the benefit of these trousers? Let's look at the critical trauma patient--the patient with a gunshot wound of the abdomen, knife wound, steering wheel injury to the abdomen, or crush injury to the leg. What can you do? IV fluids may be your first answer but this may not be sufficient to save his life. The military anti-shock trouser (MAST) can take one of these critical patients and transform him into a stable, non-bleeding, retransfused from his own legs, viable human being. He can then be moved to the hospital where X-rays, IV fluids, and blood can be obtained. He can be taken to the operating room. When everybody is ready the device can be rapidly removed and the operation proceed to definitively treat the source of bleeding. It is probably the most significant invention in the care of trauma case that has been

developed since the use of IV fluids or closed chest cardiac massage and these last two items do not provide much definitive support in severe trauma. Thus, the U.S. Army Aeromedical Research Laboratory has invented something that is highly applicable to nearly every type of trauma problem.

(Note: Dr. Nagel responded to questions from the conference attendees which I have attempted to summarize.)

Medico-legal Responsibility in Emergencies. This subject could be the basis for many textbooks or a simple state of the arts opinion. With regard to Good Samaritan legislation we are told that agencies responding only intermittently to emergencies probably fall within the purview of such. Agencies whose primary daily responsibility is emergency response may not. However, all such legislation is interested in appellate court and may well not stand appeal. Thus, we are left to good practices and the judgement of the judge and jury if sued.

The Problem of Willingness of a Physician, Military or Civilian, to Accept the Responsibility of Radio Directed Emergency Medical Care. Most urban areas are developing or now have emergency care systems which offer some type of medical treatment. MAST operation should be tied into such systems in such a way that the medical care which is indicated can be performed aboard your aircraft. The MAST medical personnel should be trained to operate from a medical base such as your military hospital to enable physician directed medical treatment. This is in those life threatening problems which need treatment "right now."

The old days of providing no medical treatment during transport are no longer acceptable. The air transport should tie into a medical ground system. It can be either a military or a civilian system. For instance at our hospital we have an FAA approved pad just built and equipped with a ground radio station on your frequency with personnel trained to operate it.

Disaster Planning. The L-1011 crash a year ago taught us many things that deserve repeating. Most of the occupants were either all dead or all alive. There were few in between (approximately 100 dead and 70 alive). We had seven helicopters in the area, three Coast Guard and four Air Force, all coordinated by one fixed wing aircraft. Three newsreel helicopters were also in the area controlled by no one. We also had three air boats operating in the swampy area and that was the first time that we ever had vertical air

blast machines and horizontal air blast machines working together. If you attempt to satisfy all the various disaster conditions and itemize them in a book, no one will read it; if they read it, they won't understand it; if they understand it, they won't remember it; and if they remember it, they won't use it. Let's apply our effort to the daily emergency system. If it works well on a daily basis it will provide the primary response in time of disaster.

Motivation Aspects of the Skilled, Trained Rescue Squad in the Miami Program. The civilian fire department employee is generally a bright, motivated career individual. Rescue squad activities help the whole fire department and the firemen's image. The citizens write hundreds of supportive letters. We've never had a lawsuit or even a threatened one. If the paramedics in your area aren't willing to do it, or are not interested in the increased capability, notoriety, and fun of working in the system, then I don't think a simple increase in wages or another stripe will do it.

Medical Procedures and Public Acceptance. All medical procedures are accomplished at the radio direction of a physician. Defibrillation was a first procedure. The starting of an IV took a lot of effort to initiate in terms of public acceptance. The problem of giving IV drugs was then considered. Most of the public seemed more concerned with attempts to start IV's than with drug insertions into the intravenous channel obtained. Finally we came to the use of the endotracheal tubes and finally the anti-shock trousers (MAST).

We did everything a step at a time. We monitored the ECG and radioed first. We didn't do another thing until everybody was comfortable with the radios and the monitor. Then we began defibrillation until a comfortable familiarity was obtained. We then applied the same slow deliberate approach to IV fluids, drugs, intubation, and the military anti-shock trousers.

The Type of Drugs Utilized Under the Direction of a Physician. I must emphasize the drugs are used only on order of the physician. We started with the standard cardiac arrest drugs--sodium bicarbonate, atropine, lidocaine, epinephrine, and calcium chloride. We utilize a system whereby the drugs are prepackaged in syringes ready for immediate use. Then we added 50% glucose because we are called for a number of diabetics. They are frequently found unconscious. Our men draw a blood sample, start the IV, and then give the 50% glucose. The blood sample is important because the hospital doesn't complain that their diagnosis is ruined.

The seventh drug we added was diazepam, because we see a large number

of convulsions or seizures. It is short acting and doesn't tend to stop breathing.

The final drug added was morphine. We don't use morphine for pain except in very rare cases. For example, in a burn case where the patient is in severe pain and the IV is started, we will give morphine. A second example is in crash injury with trapped victims. If the blood pressure is good, we will use morphine for pain in that situation. These situations are rare. It is mainly used for heart attacks, with congestive heart failure. THESE DRUGS ARE GIVEN ONLY ON ORDER BY RADIO CONTACT WITH THE DOCTORS IN THE HOSPITAL.

Discussion of the Need for a Physician to Accompany an Extended Flight. If your personnel are trained to provide critical emergency medical care, then the necessity for physicians aboard aircraft should be rare. If communications with medical base are a problem or the flight is very extended then inflight physician attendance may be necessary.

Cost Studies - Civilian versus Military. If either the military or civilian agency wants to talk about doing it cheaper, beware. Do what cheaper? The civilian agency may add your costs and include trucks in the ordinance corps, desk space in Washington, until the costs are astronomical. If the military in turn look at civilian agencies they may find that they're flying missions for newspapers and carrying passengers, and doing many things other than medical missions. The costs are spread in such a way that it's impossible to compare the data directly. In Miami we had a direct confrontation with a civilian ambulance agency. We were able to show that the frequency of our patient load was low and our medical capability was in general superior to that which could be obtained from civilian sources. To obtain equal or superior emergency medical care, the cost of the civilian agency would be exorbitant to the taxpayer for the small number of cases requiring this care.

Thank you for the opportunity to be with you at this conference and speak of advanced emergency medical care and its possible application to air transport systems, both military and civilian.



## **MEDICAL AND RESCUE EQUIPMENT FOR HELICOPTER AEROMEDICAL EVACUATION**

The rapid advancement in the field of emergency medical equipment has been stimulated by the impact of Federal funding of state emergency medical services. The commercial medical equipment manufacturers are producing an overwhelming number of devices. The problems for the helicopter unit and the U.S. Army Aeromedical Research Laboratory are the constraints of size, weight, resistance to vibration, humidity and temperature variation, interface with aircraft power, and limit of electromagnetic interference with aircraft avionics.

Equipment under evaluation by the U.S. Army Aeromedical Research Laboratory was available for review. These items included various litter types, splints, emergency suction devices, electrocardiographs, cardiac monitor/defibrillators, spinal support boards and various types of casualty blankets. The U.S. Air Force School of Aviation Medicine reviewed equipment under evaluation for the U.S. Air Force aeromedical evacuation system. This equipment included a portable liquid oxygen system, an electronic nebulizer, ECG monitor, defibrillator, a portable incubator, and intravenous infusion pumps.

The installation of this sophisticated medical equipment in the helicopter air ambulance requires consideration of the mission, whether rescue or inter-hospital transfer. The medical/paramedical personnel aboard the helicopter must be skilled in the use of the equipment in improving the level of medical care. The interhospital transfer usually requires the most equipment. In most cases, a physician will accompany the seriously ill patient. The equipment, however, must be capable of being utilized by the air ambulance corpsman under all mission requirements. This provides the primary impetus to insure highly skilled corpsmen are capable of utilizing the equipment. Additionally, radio communication with a physician to provide a treatment capability by the air ambulance corpsman is inherent in the upgrade of medical equipment. Telemetry of physiologic data to a hospital center is an ongoing effort by the U.S. Army Aeromedical Research Laboratory.

The equipment listed in Appendix A is selected from the Federal Supply Catalog in response to specific requests during the conference. Comments regarding utilization of the equipment are provided as guidelines.

## MEDICAL/LEGAL ASPECTS OF AEROMEDICAL EVACUATION

A panel discussion was presented. The following comments have been summarized and are not intended to be a complete review of the subject.

An impression of civilian experience in the city of Birmingham, AL, was presented. It was noted that the referring physician must be satisfied the patient is stabilized enough to be moved prior to initiating the request. The emergency medical technician has, on many occasions in the large city of Birmingham, determined the patient to be unstable for travel, and upon requesting reevaluation by the responsible physician, the EMT's opinion has been proven correct. The Medical Council of Alabama has given permission to the emergency medical technician to start intravenous fluids and defibrillate, but only with permission from a physician by radio.

In regards to the Alabama Good Samaritan Act, it has not been tested in court. This Act protects persons from civil liability who render emergency care at the scene of the accident or disaster. The U.S. Army Fort Rucker Judge Advocate General representative stated that this Act could only be tested by litigation; however, it would appear that if a helicopter goes to the scene of an accident, this would fall within the scope of the Act. This does not apply to interhospital transfer. The Good Samaritan Act also includes the statement that any doctor, nurse, or member of an organized rescue squad who does not charge for the service is protected. The factor of gratuitous service may be the key word that would protect most military in these operations.

A review of the application of the Federal Torts Claims Act was presented. This holds the implication for the military aeromedical aircrew that the medical corpsman, nurse or physician who acts within the scope of his employment or duties will be covered by the overall blanket of the Federal Torts Claims Act. It was felt that any military individual acting without negligence will incur no personal liability. The emergency circumstances and the gratuitous services provided would be additive to the effect of the Federal Torts Claims Act.

The USAF Domestic Aeromedical Evacuation System. The U.S. Air Force domestic aeromedical evacuation is provided by the 375th Aeromedical Airlift Wing, Scott AFB, IL. This unit, due to the lack of available physicians, usually dispatches two nurses and two medical corpsmen aboard the C-9 aircraft in response to urgent and priority aeromedical evacuation missions. The

Wing Surgeon requests the referring physician to provide physician support aboard the aircraft in the case of critical patients. This becomes somewhat difficult when the civilian physician refuses to furnish a doctor or states they do not have a doctor available to travel. A flight clinical coordinator, a nurse, usually receives all the medical information available and then coordinates with the Wing Surgeon prior to final approval of a mission. Additionally, the flight nurse who is on the aircraft when the patient is onboard receives a full briefing from the physician or a nurse at that time. The U.S. Air Force flight nurse aboard the aircraft has the right to refuse to move the patient if she does not feel he is stable or is unprepared for flight. At this point, the request is then made to the physician who is requesting the movement to accompany the patient on the flight and to maintain the primary responsibility for the patient. It was pointed out even if the flight nurse in command feels that some directive is contraindicated by current operating standards, she still remains subordinate to the physician's instructions as he retains primary responsibility. By the same token, this physician is not responsible for any other patient on the aircraft nor can he interfere with their management. For the U.S. Air Force to move a civilian by C-9, permission from the Department of Transportation is required. A single individual is usually contacted and, in most cases, approves the move depending on the Wing Surgeon's opinion as to whether it is or is not a valid emergency requirement.

Utilization of a Civilian Nurse on Flight. An additional problem under the current MAST operating directives was the fact that a nurse may be considered by a physician referring a patient to be the qualified medical attendant from a civilian hospital. If this nurse should enter the USAF C-9 aircraft, who would then retain the primary responsibility for the patient--the flight nurse or the nurse accompanying the patient? In the years of the U.S. Air Force aeromedical evacuation operation, this situation has not arisen. A definitive answer could not be given. A question was posed to the Air Force unit on the authority of the flight nurse aboard the aircraft as to her initiation of medical treatment, i.e., to start an intravenous line or give drugs. It was pointed out that this nurse is under the orders of the physician in the medical records that accompanied the patient. If she is required to institute other therapy, she is able to contact the Wing Surgeon or his assistant by radio to obtain permission.

In-Flight Death. The problem of an in-flight death occurring aboard an Air Force aircraft is handled by continuing the flight to the nearest military airfield. In this case, the nurse cannot legally pronounce the patient dead nor enter into discussion with the civilian community concerning crossing state

lines and the varied administrative details. By continuing to the nearest military airfield, a physician is easily reached and administration is simplified.

The USAF Pararescue Corpsman. The USAF helicopter unit commented that their U.S. Air Force pararescue man theoretically, within the scope of Air Force training and duties, has the capability of starting IV's, accomplishing cutdowns, and even thoracentesis. When the patient is on the Air Force helicopter, the pararescue man in most cases has no radio communication. In this case, a patient could enter the helicopter, an IV be started, and, subsequently, the patient die in flight. The pararescue man is considered essentially to be operating within the Air Force scope of training. The question of "What is the medical/legal position of the aircraft commander and the USAF pararescue man in this situation?" was posed to the JAG representative. In this case, it was felt that an agreement must be reached between the MAST Coordinating Committee for the state and MAST helicopter unit. It was strongly urged that all unit commanders in attendance at this conference contact their flight surgeon and/or hospital commander to coordinate with their respective state MAST Coordinating Committees and medical councils to ascertain exactly what is acceptable emergency care.

Civil Suit in the Case of Aircraft Accident. The problem of a civil suit involving a civilian patient in an aircraft accident was presented. The JAG representative's unofficial opinion is in this case the United States would be the defendant under the Federal Torts Claims Act. In theory, however, if an act was wanton or gross negligence on the part of the aviator, a civil suit could be brought to bear on the individual. The nearest U.S. Attorney would plead the case. It was felt that in this case the accident investigation report is not recoverable under the very liberal rules of federal civil procedures. The collateral report, however, is discoverable but is usually not admissible to prove culpability or liability on the part of the aviator. It was pointed out that the court must ask for permission for the privilege of using this information from the Secretary of the Army or the Air Force. This type of proceeding would then go to the three member federal panel to rule on whether or not the civil court judge should be allowed access to this information. At present, there is apparently no case of the formal privilege of confidential information being challenged by a judge and overruled by the federal panel.

Release Form or Consent Form. The use of release forms for the civilian patient in a military aircraft was reviewed. A release form is not required for the "rescue" type of aeromedical evacuation mission. The need for a civilian

release form for interhospital transfer was considered efficacious in particular states. The Air Force, at present, does not require release forms for a civilian in the Air Force C-9 aircraft. It has been pointed out that conflicting directives have been issued to the U.S. Army helicopter units on the need for a release form. (Note: Directive concerning the need for a civilian release form is to be sought from both the Health Services Command and FORSCOM.)

## SUMMARY

### Mission

The mission of helicopter air ambulance units has two phases. RESCUE--this is the combat evacuation of front line wounded or peacetime accident injury victim. INTERHOSPITAL--this is the tactical aeromedical movement from the initial stabilizing facility to the next highest echelon of medical care. In peacetime this represents the aeromedical evacuation of military and civilian patients from limited treatment medical facilities to regional treatment or specialized treatment centers. The objective of this conference was to review the operational and equipment needs to improve medical care during aeromedical evacuation.

### Command

The U.S. Army helicopter units are under a varied command and control structure. The immediate command chain may include the post commander, line unit commander, or medical group or battalion commander. The units are usually under command of medical groups which in peacetime have no physician assigned except on a contingency basis. Only one unit is assigned directly to a major medical center--this is the TDA unit at the U.S. Army Aeromedical Center.

### Personnel (Crew and Training)

The crew of the air ambulance helicopter consists of a pilot, copilot, crew chief and air ambulance medical corpsman. The primary emphasis of this conference was on the training of the U.S. Army air ambulance medical corpsman. The provision of the highest level of medical care available in the air

ambulance is required to further reduce the mortality in combat helicopter aeromedical evacuation. The provider of this initial medical care, to include resuscitation and stabilization, is the helicopter air ambulance aidman. The level of care available is entirely dependent on the skill of this medical corpsman.

The current MOS structure provides a maximum rank of E5 and a skill level of 91B20. The lack of a full career field provides the loss through promotion or lack of career opportunity of a highly skilled corpsman who has attained the level of emergency medical technician.

The multi-climatic conditions encountered in rescue operations require the corpsman to develop the medical knowledge to effect a successful rescue and resuscitation/stabilization in jungle, desert, arctic, mountain and over water environments. This requires continued training in these specific operational areas. The medical skill of the corpsman must also be evaluated frequently to insure competence and to upgrade his technical skill.

The MAST mission has pointed out the requirement to improve the medical skills and capability of the air ambulance corpsman. These skills include the utilization of increasingly sophisticated equipment and therapeutic intervention. To improve medical care to the ultimate is to have the medical corpsman reach the level of, and be authorized to, resuscitate by intubation, defibrillate, start intravenous fluids, and lastly, give medications on order by radio communication with a physician. The interhospital movement of MAST civilian patients will in the near future demand care of this type.

A career field, MOS structure and well defined medical skills for the air ambulance medical corpsman are strongly recommended.

A secondary emphasis must be placed on providing improved basic medical training for the other crewmembers, the pilot, copilot and crew chief.

#### Mission Request Under MAST

Mission requests are received in most units by the helicopter air ambulance operation or command section. In "rescue" situations response should be immediate to the civilian paramedical and enforcement agencies' requests.

In interhospital transfer operations, a physician, fully cognizant of aeromedical evacuation procedures and operation, should be included in the mission approval sequence. This physician may be civilian or military to discuss the indications and contraindications to aeromedical evacuation with the requesting physician or hospital and the aeromedical aircrew.

### Communications

The capability to communicate in emergency medical service has proven to be an absolute requirement. In aeromedical evacuation primary emphasis is on the aircraft radio compatibility with other emergency services to include medical services, law enforcement agencies, and municipal agencies. In the military area communications are more easily controlled. In the peacetime MAST operation the interfacing of radio with the civil agencies presents a formidable task.

Multichannel radios capable of communicating with the various civilian agencies are to be procured by the civilian agencies and installed in the military helicopter. This effort, unfortunately, as pointed out does not include maintenance funds or civilian maintenance capability of the radios.

It is recommended that the helicopter units preparing for the MAST mission insure that the radios purchased be fully compatible with the Emergency Medical Service net and other law enforcement/civilian agencies. Additionally, provision for maintenance, repair and replacement must be made.

### Physician's Role in Aeromedical Evacuation

This conference demonstrated the many areas of confusion over the role of the physician in aeromedical evacuation sequence. The physician in the support of the air ambulance should have a strong interest in emergency medicine and aviation medicine. A military flight surgeon readily fulfills these criteria.

The physician must be willing to be readily available by radio/telephone communication on an around-the-clock basis to adequately provide the aeromedical input. The instruction of the emergency medical technician/air ambulance corpsman in the techniques required in helicopter evacuation is a primary responsibility of the physician.

In the mission request sequence, the physician should be included. In the RESCUE concept the physician can insure appropriate special equipment and/or additional personnel are on board. In the INTERHOSPITAL transfer mission the physician must insure the requesting physician is fully cognizant of the equipment and personnel on the aircraft as well as the hazards of flight. If the requesting physician or competent specialized medical attendant cannot accompany, the unit physician may do so.

It is to be emphasized the physician is NOT required on each and every flight. The flight surgeon, however, must be available to insure medical care never decreases once the patient enters the medical system. The requirement to have radio communication with the air ambulance corpsman is essential to providing medical treatment in flight, such as IV medications, defibrillation, intubation, ventilation and other primary therapeutic maneuvers.

The transport of civilian patients in a military aircraft requires careful medical consideration of the effect of the flight on the patient. The medical/legal considerations must be considered in the MAST mission. This is particularly important in the interhospital transport mission.

#### Medical/Legal Aspects of Helicopter Air Evacuation

Problem areas were noted which require determination of responsibilities and applicable directives. These included adequate definition of the scope of duties and procedures to be performed by the helicopter air ambulance corpsman. Coordination with the local and state medical council in this problem area is required.

Determination of the need for civilian release of liability form prior to interhospital transfer remained undetermined. In the rescue mission a release form was considered unnecessary.

The transfer of responsibility for the patient from the helicopter air ambulance at the delivery point to competent medical authority remains questionable in some areas. That of transfer to a routine ambulance service for movement from helipad to a distant hospital could prove to be a difficult problem.

The rescue mission was considered to be within the coverage of Good Samaritan Laws by virtue of its emergency service rendered gratuitously.



In the interhospital transfer mission an overall medical/legal determination has not to this date been made.

#### Data Collection and Evaluation

The problem of follow-up of the patient to provide data as to the effect of helicopter evacuation is at present limited. A standard format has not been applied. The New York State Health Department (NYSHD) form is being utilized by most units. Medical data recovery is, however, limited. Analysis of data to date does not provide information to determine impact of the MAST program on the Emergency Medical Service in the civilian community. An upgrade of the NYSHD form is underway and is anticipated to improve clinical data and follow-up.

#### Medical Equipment

This conference emphasized the need for upgrading and standardizing the medical equipment for use in U.S. Army helicopter aeromedical evacuation. The constraints of weight and size in addition to the requirements to protect against electromagnetic interference, noise, vibration and temperature extremes all affect design and development efforts.

Current emphasis at the U.S. Army Aeromedical Research Laboratory is on the problem areas of ventilation/resuscitation, suction devices, physiologic data acquisition/monitoring/telemetry, cardiac monitoring/defibrillation, infusion devices and oxygen equipment. These items represent those most needed to improve the quality of medical care required during the transport phase of aeromedical evacuation.

The overall effort in this area should prove itself in combat operations or peacetime support of the trauma patient by a further decline in mortality statistics.

#### Future

The U.S. Army Aeromedical Research Laboratory provides a central point of aviation and aeromedical research effort. In the future it is anticipated

that continued conferences of this type can be held to provide the interchange of information required between the operational unit--the USER--and USAARL--the DEVELOPER.

## REFERENCES

1. Neel, S. H., "Army Aeromedical Evacuation Procedures in Vietnam," JAMA, 204: 309-313, 1968.
2. Mateer, C. A., "Review of Proposal for Military Support of Air Medical Evacuation System AMES to Aid Highway Accident Victims," Memorandum Review, 1969.
3. Kaplan, B. H., Civetta, J. M., Nagel, E. L., Nussenfeld, S. R., and Hirschman, J. C., "The Military Anti-Shock Trouser in Civilian Pre-Hospital Emergency Care," Journal of Trauma, 13: 843-848, 1973.

## APPENDIX A

### Equipment List

Selected items of equipment for use by air ambulance units are currently listed in the Federal Supply Catalog. Items are noted in response to interest demonstrated at the Aeromedical Evacuation Conference. This list is not to be construed as a recommendation or requirement. Comments are those of the author and are intended to emphasize problem areas.

<u>Equipment</u>	<u>Remarks</u>
1. Defibrillator and Cardioscope FSN: 6515-00-584-6801	This item is adequate if on hand. The scope is small but usable. Testing of radiomagnetic emissions is to be accomplished prior to full acceptance in the UH-1. If ordering new, contact USAARL for assistance.
2. Infusor, Pressure, Blood-Collecting-Dispensing Bag FSN: 6515-00-584-2893	This item is for use with the plastic IV bags. It provides pressure to the bag to insure as rapid a flow as possible or to maintain flow in the event the bag must be placed on the litter.
3. Laryngoscope Set:	A laryngoscope set is considered basic equipment for resuscitation and should be available on the aircraft for use by qualified personnel.
a. Child-Adult Wisconsin (straight blade) FSN: 6515-00-346-0480	
b. Infant Child-Adult MacIntosh (curved blade) FSN: 6515-00-616-5052	
c. Infant Miller, 100 mm FSN: 515-00-656-0474	
d. Premature Infant, Miller 75 mm FSN: 6515-00-656-0475	

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APPENDIX A - Equipment List (Continued)

<u>Equipment</u>	<u>Remarks</u>
4. Resuscitators, Hand Operated Two types are available:	Usable, but some disadvantages must be recognized. Comments from the <u>Bulletin of the American College of Surgeons</u> , May 1970, note that valve of both resuscitators freezes when used at 32° F or below and with high O <sub>2</sub> flow valve may lock in the inspiratory position.
a. Resuscitator, Hand Operated Intermittent Positive (Hope (TM) Resuscitators) FSN: 6515-00-018-9494	
b. Resuscitator and Aspirator Intermittent, provides pressure, manual cycling (AMBU) FSN: 6515-00-890-1818	
5. Splint, Leg (Reference Federal Supply Catalog Index No. 10820, 25, 30, 35, 40, 45.) Hare, adjustable, half ring FSN: 6515-00-418-6589	Splints are usable based on training and experience of your personnel. The Hare splint has been an item of interest.
6. Splint Assembly, Full Body Rescue and Transport FSN: 6515-00-405-5391	This is commonly known as the Green splint.
7. Valve, Surgical Drain (Heimlich) FSN: 6515-00-926-9150	This is a disposable item for use in transporting patients with a chest tube in place. Chest tubes <u>should not</u> be clamped for flight.
8. Traction Appliance, Cervical Injury	These items are desirable with inter-hospital transfer of traction patients. Eliminate the use of hanging weights.
a. Collins Litter Type FSN: 6530-00-926-4732	
b. Collins Stryker Type FSN: 6530-00-926-4731	

## APPENDIX A - Equipment List (Continued)

<u>Equipment</u>	<u>Remarks</u>
9. Medical Instrument & Supply Set, Aeromedical Rescue and Recovery Team FSN: 6545-00-935-5890	Good general purpose kit adaptable to "RESCUE" situations for UH-1 air- craft. (Presented at the conference)
10. Manikin Resuscitator, Training FSN: 6910-782-5578	Resusci-Andy for training purposes.

Nonstandard equipment considered useful but not fully evaluated as to compat-  
ibility with the helicopter environment:

<u>Equipment</u>	<u>Remarks</u>
1. Suction Unit Laerdal (Laerdal Medical Corp.)	This item is a self-contained battery operated suction device. Not fully tested as yet for EMI effects. Com- parison of emergency aspirators in <u>Health Devices</u> , March 1974, docu- ments advantages and disadvantages. (Contact USAARL for information.)
2. Resuscitator, hand operated Resusci Folding Bag Mark II (Laerdal Medical Corp.)	Best available resuscitator commer- cially available today. Reference <u>Bulletin of American College of Surgeons</u> , May 1970.
3. Spine Boards Local Fabrication	See <u>Bulletin of American College of Surgeons</u> , May 1970.
4. Incubator, Transport, Air Evac (Ohio Medical Products)	This item has been operationally tested and evaluated by USAF for EMI. It has the capability of using 115 V 400 Hz aircraft power as well as battery pack.

## APPENDIX A - Equipment List (Continued)

<u>Equipment</u>	<u>Remarks</u>
5. Oxygen Analyzer (Biomarine 202R is currently in use by USAF.)	This should be used to monitor O <sub>2</sub> available within the incubator.
6. Infusion Pump IV Fluids for use in pediatric case aeromedical evacuation. (Holter Model 911)	The Holter infusion pump Model 911 has been evaluated by USAF for aero- medical use. One significant problem is the possibility of air embolism if fluids are exhausted or pump chamber is punctured. Operates from 115 V 50-400 Hz plus internal battery.
7. Military Anti-Shock Trousers (USAARL)	Limited numbers are available for operational test and evaluation from USAARL.

## APPENDIX B

### Sample Incident Report Form

CITY OF MIAMI FIRE DEPARTMENT  
RESCUE INFORMATION FORM

**MODIFIED  
SIMBOL**

TO CALCULATE STATUS SCORE:

CORRECT ADDRESS:

ESCRIBA VD LA INFORMACION EN ESTA FORMA:

NOMBRE DE VICTIMA:

NAME OF VICTIM:

DIRECCION DE VICTIMA:

ADDRESS OF VICTIM:

EDAD  
AGE:

EVALUATION:

CHIEF COMPLAINT

	DEFIB		
EQUIPMENT USED:	BP		
	P		
	R		
	IV	D/S R L	
	SICARD.		
	ADRENALIN		
	ATROPINE		
POLICE CAR:	AMBULANCE:	XYLOCAINE	
HOSPITAL:		CALCIUM	
ALARM #		VALIUM	
ALARM @	OS @	M. S.	
ARRIVED @	QTRB. @	80% GLU	
MILES:			

VALUES SIGNS	0	1	2
Blood Pressure (Palm-Systolic)	Absent	Less Than 80	More Than 80
Pulse	Absent	Less Than 50 Over 100	Between 50 - 100
Respirations	Absent	Less Than 10 More Than 20	Between 10-20
Level of Consciousness	Totally Unresponsive	Difficult to Arouse, Sleepy	Awake and Coherent
Pupils	Dilated Fixed	Unequal or Sluggish	Responsive to Light
Color	Cyanotic	Pale, Ashen, Sallow	Normal

NOTE use sign, COLOR, only when Blood Pressure has not been evaluated.

TO CALCULATE PREDICTOR VALUE:

1. Status Value \_\_\_\_\_
2. Age Score \_\_\_\_\_
  - a. if between 12 and 35 yrs. of age, add 1 point
  - b. if between 60 and 70, subtract 1 point
  - c. if over 70, subtract 2 points
3. Weight Score \_\_\_\_\_
 

If markedly overweight, subtract 1 point
4. Critical Factor Score \_\_\_\_\_
 

Subtract 1 point for each of the following

a. Trauma to head or neck	e. difficulty breathing
b. open chest or abdominal wound	f. fractured bones
c. unconscious	g. significant hemorrhage (estimate ≥ 1 pint)
d. paralysis of any extremity or portion	h. open wound to brain or heart (-5)

TOTAL = Predictor Value (Sum of 1 2 3 4) \_\_\_\_\_

AIR MEDICAL EVACUATION SYSTEM

CITY OF MIAMI FIRE DEPARTMENT



## APPENDIX C

### List Of Attendees

MG William J. Maddox, Jr.  
Commander  
U.S. Army Aviation Center and  
Fort Rucker  
Fort Rucker, AL 36360

COL Lloyd Spencer  
Assistant Chief of Staff  
U.S. Army Health Services Command  
Fort Sam Houston, TX 78234

COL Kenneth W. Curtis  
Wing Surgeon  
375th Aeromed Airlift Wing  
Scott AFB, IL 63235

COL Myrl E. Wilson  
USAF SAM/NGB  
Brooks AFB, TX 78235

COL Raphael J. DiNapoli  
U.S. Army Health Services Command  
Fort Sam Houston, TX 78234

COL James G. Humphrys  
Director  
Department of Graduate Flight Trng  
U.S. Army Aviation School  
Fort Rucker, AL 36360

COL James E. Hertzog  
Commander  
Lyster Army Hospital  
Fort Rucker, AL 36360

COL William P. Schane  
Director, Aviation Medicine Research  
Division  
U.S. Army Aeromedical Research Lab  
Fort Rucker, AL 36360

CAPT Andrew F. Horne, M.D.  
Senior Flight Surgeon  
U.S. Public Health Service  
Washington, D.C.

CAPT William D. Harvey, USCG  
MAST Interagency Executive Group  
c/o U.S. Department of Transportation  
Nat'l Highway Traffic Safety Admin  
400 7th Street, S.W.  
Washington, D.C. 20590

LTC Daniel T. Sanders  
HQDA (DASG-HEO)  
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LTC Ernest D. French  
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498th Medical Company  
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LTC Freddie Mills  
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**APPENDIX C - List of Attendees (Continued)**

**COL Robert W. Bailey**  
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**LTC Larry L. Grabhorn**  
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**LTC Fred D. Frederick**  
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Fort Rucker, AL 36360

**LTC Neal H. Walls**  
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**LTC Nicholas E. Barreca**  
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101st Airborne Division  
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**MAJ George R. Webber**  
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**MAJ Mayo K. Ellingson**  
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**APPENDIX C - List of Attendees (Continued)**

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**MAJ Ronald L. Bachman**  
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**APPENDIX C - List of Attendees (Continued)**

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Command Flight Safety  
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**LCDR Donald J. Aites, USCG**  
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**CPT Michael G. Sanders**  
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**CPT Dennis A. Baeyens**  
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**CPT Thomas L. Frezell**  
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**APPENDIX C - List of Attendees (Continued)**

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**CPT Juanita Clausen**  
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**CPT Blanco T. High**  
C, Personnel Div  
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**CPT James L. Ritchie**  
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**CPT James A. Williamson**  
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**1LT Robert A. Mitchell**  
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**Ms. Ida Martha Reed**  
Coordinator, Community Rsch & Dev  
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